Metal-insulator Transition in the Novel Spin-orbit Coupled Mott Insulator Sr_2IrO_4

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Strong spin-orbit coupling inherent in heavy 5d elements can bring an otherwise weakly correlated 5d transition-metal oxide to a Mott instability, with the resulting localized electrons highly spin-orbit entangled. A prominent example is Sr_2IrO_4 with its magnetic moment described by the effective total angular momentum $J_{eff}=1/2$. Despite their exotic spin-orbital structures, their magnetic interactions in the square lattice geometry are described by the Heisenberg Hamiltonian, which makes the low-energy physics of Sr_2IrO_4 much similar to that in high-temperature cuprate superconductors. Recent theories have hence proposed Sr_2IrO_4 as a new platform for high-temperature superconductivity. However, doping this material with either electron or hole has been very challenging. In this talk, I will present the angle- resolved photoemission spectral evolution across the Mott transition in Sr_2IrO_4, induced by the *in situ* doping method. The spectra show similarities as well as dissimilarities with those of cuprates, which provides basis for identifying universal features of (iso)-spin one-half Mott insulators in square lattices.